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(12) # EUROPEAN PATENT APPLICATION

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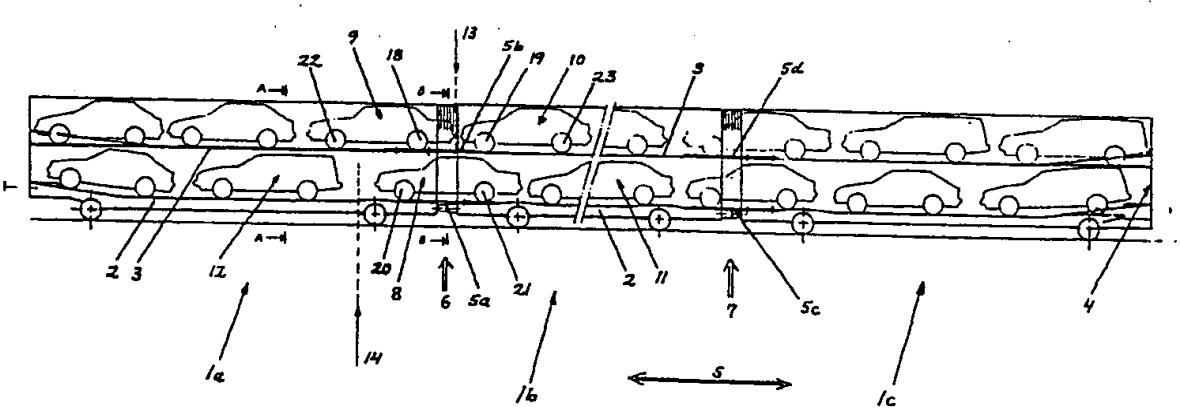
(54) **A railway wagon combination.**

(57) The invention relates to a structure for forming a combination of car-carrying railway wagons (1a...c) or the like, wherein the vehicles or the like to be transported can be placed successively and across the couplings (6, 7) between the wagons, irrespective of the couplings. In this case, there is disposed in the area of each coupling between two wagons (1a and 1b; 1b and 1c) a supporting bridge (5a...d), which is capable of being fastened rigidly to one wagon (1a or 1b; 1b or 1c), while the other wagon can move in relation to the supporting bridge.



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A railway wagon combination

The invention relates to a structure for forming on the railways a combination of car-carrying wagons or corresponding wagon combinations, wherein the vehicles or the like to be carried can be placed successively and across the couplings between the wagons, independently of them.

When cars or other vehicles or the like are carried in car-carrying wagons or the like on the railways, the cars are typically driven onto a railway wagon's deck, of which there may be one or several, one above the other. Typically the loading takes place by driving the cars from the end of the row of car-carrying wagons, in which case the cars can be driven from one wagon to another along driving bridges turned down between the railway wagons. When each wagon has been loaded with the number of vehicles it has capacity for, the driving bridges are folded to the side at the coupling points between the wagons, so that the wagons can move in the normal manner in relation to each other during transport. There are also other loading methods.

Regardless of the loading method, when car-carrying wagons are used there is always the problem that, the railway wagon being of predetermined dimensions and the cars varying in length, the total combined length of the cars will not tally with the length of the car-carrying wagon. Thus there is usually wasted space left in each wagon, and this space may often be considerable if the situation is such that one car does not quite fit in the wagon. Although it could be thought that the driving bridges between the wagons are not raised and cars are placed so that either their front wheels or rear wheels are on the driving bridge, or that the front wheels are in one freight wagon and the rear wheels in another freight wagon, such practice is not possible for the reason that the movement between the wagons is transmitted to the car and causes various types of damage to it. This is understandable, since in such a case the front end of the car is moving along with one wagon and the rear end with another wagon, whereby tension, compression, bending and torsion are produced in the car.

The object of the invention is thus to provide a structure which enables a car-carrying wagon or the like to be filled with vehicles so that in the wagons there is left no wasted space due to differences between the varied vehicle lengths and the predetermined length of the wagon. It is another object of the invention to provide a structure in which the vehicles can always be placed in the wagons in their longitudinal direction, as close to each other as possible and in such a manner that this placement is not affected by the couplings between the different wagons. It is a further object of the invention to provide a structure which enables each vehicle to be placed in the car-carrying wagon in such a manner that no inter-wagon movements are transmitted to it; in this case the vehicles will not be subject to wear or damage.

By using the structure according to the invention the above-mentioned objectives can be achieved and a crucial improvement is accomplished regarding the disadvantages described. To accomplish this, the structure according to the invention is characterized in what is stated in the characterizing clause of Claim 1.

It can be deemed to be the most important advantage of the invention that the car-carrying wagons can be loaded full with vehicles of the like, without wasted space. It is a further advantage that all of the vehicles can be conventionally driven to any of the places in the wagons and can be secured to the wagon normally, all in the same manner. It is a further advantage of the invention that the structure can be manufactured at a very low cost compared with the price of the freight wagon itself.

The invention is described below in detail with reference to the accompanying drawings.

Figure 1 depicts as a side elevation the principle of the railway wagon combination according to the invention,

Figure 2 depicts a cross section through A-A of the railway wagon combination of Figure 1,

Figure 3 depicts the railway wagon combination of Figure 1, through B-B.

Figure 1 depicts a schematic side elevation of a car-carrying wagon combination according to the invention. The wagon combination is made up of individual car-carrying wagons 1a, 1b, 1c, which have conventionally been coupled to each other for the duration of their transport on the railway. In this embodiment, each car-carrying wagon has a lower freight deck 2 and an upper freight deck 3. All of the disclosed facts pertaining to the invention apply to both the upper deck and the lower deck. In this case the wagons are loaded by driving the cars in from one end 4 of the row of railway wagons.

Figure 2 depicts a cross section of an individual freight wagon 1a to illustrate the placement of the vehicles, the construction being at this point at least in the main conventional.

In accordance with the invention, supporting bridges 5a...d are placed between each two car-carrying wagons, in this case between wagons 1a and 1b and respectively between wagons 1b and

1c. the bridges thus being rigidly attachable at the coupling point 6 either to wagon 1a or 1b and at the coupling point 7 to either wagon 1b or wagon 1c. The supporting bridges 5a and 5b can be seen clearly as a cross section in Figure 3 under the vehicles 8 and respectively 9. Typically the supporting bridge has a minimum length of the axle spacing of the vehicles to be transported so that, when necessary, a vehicle can be placed only on top of the bridge. In addition, the supporting bridge can be shifted in the longitudinal direction S of the wagons in order to fit in each given case under the vehicle to be transported, to support the vehicle. This fact is evident, for example, at the coupling point 6 in Figure 3, where the vehicle 8 on the lower deck 2 is more or less centred across the coupling 6. The vehicle 9 on the upper deck 3, on the other hand, is clearly offset from the centre of the coupling, although the rear part of the vehicle 9 is in the area of the coupling. In this case the supporting bridge 5a of the lower deck is also approximately centred across the coupling, the vehicle 8 fitting entirely on top of the bridge. In this case the movement of the wagons 1a and 1b in relation to each other cannot affect the vehicle 8, but the vehicle rests securely on top of this supporting bridge 5a, to which it has been fastened in the same manner as the other vehicles have been to the wagons themselves. On the upper deck 3, on the other hand, the supporting bridge 5b is drawn as far into the wagon 1a as is necessary to produce a situation in which the rear wheels 18 of the vehicle 9 are on top of this supporting bridge but the front wheels 19 of the adjacent vehicle 10 in the next wagon 1b are not on top of this supporting bridge 5b.

In addition to the above-mentioned offset, the supporting bridge in its position offset in the above-mentioned manner in the longitudinal direction S is fastened rigidly to one of the wagons. The supporting bridge 5b under the vehicle 9 is in this case fastened to the wagon 1a, constituting a structural part of this wagon, and, as a result, the front and rear wheels 18, 22 of the vehicle 9 remain immobile in relation to each other. The front and rear wheels 19, 23 of the vehicle 10, on the other hand, are entirely in the wagon 1b, and are thus, of course, immobile in relation to each other. The supporting bridge 5a under the vehicle 8 is fastened rigidly to one of the freight wagons, constituting a structural part of this wagon. This supporting bridge can, for example, be fastened rigidly to wagon 1b, whereupon the front and rear wheels 20, 21 of the vehicle 8 remain immobile in relation to each other in connection with the wagon 1b, as do the front and rear wheels of the vehicle 11. The front and rear wheels of the vehicle 12, on the other hand, remain immobile in relation to each other in connection with the wagon 1a. Since at the coupling the wagon to which the supporting bridge has not been fastened rigidly can move, preferably completely freely in relation to the supporting bridge, the vehicles 9 and 10 on the upper deck will move in relation to each other, and respectively on the lower deck 2 the vehicles 8 and 12 will move in relation to each other, as will the wagons 1a and 1b in relation to each other. Thus, by means of the structure according to the invention the acting point at the coupling between the freight wagons is shifted to the desired distance from the actual coupling 6. In other words, the acting point, i.e. the moving point, on the upper deck is at point 13 and on the lower deck at point 14.

The structural principle described above can be applied at every coupling between car-carrying wagons, and thus it is possible to couple in a row as many car-carrying wagons as is necessary and for other reasons possible, and the entire freight wagon row can be filled completely with vehicles or the like, there being no unused wasted space left at any coupling between the railway wagons.

The supporting bridges 5 themselves are preferably, for example, "box beams" so wide that it is possible to drive on and off them, but somewhat narrower than the possible inside width of the wagon 1, so that the movement of the wagons in relation to each other on the side of that wagon to which the bridge is not fastened should not detach or damage the supporting bridge and the vehicle on top of it. In this case, for example, the ground clearance space between the wheels of the vehicles can be exploited for an oblong casing 16 in order to stiffen and reinforce the supporting bridge.

The rigid joint between the frame 17 of the freight wagon and the supporting bridge 5 can be made in many ways, for example by using a screw joint or lever joint between the longitudinal flanges 15 or the longitudinal central casing 16 of the supporting bridge and the frame 17 of the first wagon, or by other various quick locking methods which make a rigid attachment and complete detachment possible for both this rigid joint and the moving "joint". In order to enable the second wagon to move freely, the non-attached end of the supporting bridge in each case can be arranged either to be completely separate from the second wagon, in which case there is a definite clearance between the bridge and this wagon, or the supporting bridge can be allowed to rest on the even surface of the frame of the second wagon, in which case provision must be made for making possible a slight angular yield of the supporting bridge in relation to the first wagon.

Another possible variation is to arrange the structure in such a manner that the supporting bridge is not rigidly attached to either freight wag-

on but is flexibly attached to each wagon. Such a flexible joint must allow at least angular and longitudinal shifts between the supporting bridge and the wagon, the wagons moving in relation to each other, since the purpose is not to transfer the longitudinal forces of the train through the supporting bridge. However, even in this case the supporting bridge must not move considerably in the lateral direction nor shift substantially, at least not permanently, in the longitudinal direction, so that the vehicles will not touch each other or the frame of the wagon. In this alternative structure the joint must thus be flexible and self-centring. Such a structure is possible mainly when the vehicles to be transported are long and they must be centred across the coupling between the railway wagons and when the weight of a vehicle is so great that the strength and leeway for movement of the beam rigidly fastened at one end is jeopardized.

For all of these alternatives, the supporting bridges can be made divisible into parts or extendable by means of parts and attachable to each other and/or to the wagon frames in different ways so that all possible situations of use can be managed as effectively as possible. It is, of course, evident that such a supporting bridge at the same time serves as a driving bridge between the wagons and need not be folded away at any stage.

Claims

1. A structure for forming on the railways a combination of car-carrying wagons (1a...c) or a corresponding wagon combination, wherein the vehicles or the like to be transported can be placed successively and across the couplings (6, 7) between the wagons, independently of the couplings, **characterized** in that in the area of each coupling between two wagons (1a and 1b; 1b and 1c) there is disposed a supporting bridge (5a...d), that this supporting bridge can be fastened rigidly to either wagon (1a or 1b; 1b or 1c), whereupon the other wagon can move in relation to the supporting bridge.

2. A structure according to Claim 1, **characterized** in that, the fastening of the supporting bridge (5a...d) to one wagon (1a or 1b; 1b or 1c) being rigid, the other wagon 1b or 1a; 1c or 1b) can move freely without touching the supporting bridge.

3. A structure according to Claim 1 or 2, **characterized** in that the supporting bridge (5a...d) is alternatively also capable of being attached flexibly to both wagons (1a and 1b; 1b and 1c), whereupon the wagons can move in relation to each other and to the supporting bridge.

4. A structure according to Claim 1, 2 or 3, **characterized** in that the length of the supporting bridge (5a...e) is at least equal to the axle spacing of the vehicle or the like to be transported, and that the supporting bridge can be moved in the longitudinal direction (5) of the wagons (1a...d) to adjust it in each given situation in the area of the vehicle transported, to support the vehicle.

5. A structure according to any of the above claims, characterized in that the supporting bridge (5a...d) is flexibly attached in relation to both wagons when it ex tends approximately an equal amount into each of the wagons, and that it is in each case fastened rigidly to that wagon into the which most of the supporting bridge has been drawn.

6. A structure according to Claim 4 or 5, **characterized** in that the supporting bridge (5a...d) can be divided into two parts shorter than the axle spacing of the vehicle or the like, the parts being rigidly attachable to the wagon in each given case, and that these parts of the supporting bridge can be attached to each other to form one supporting bridge the length of which is at minimum the length of the axle spacing of the vehicle or the like and is flexibly attachable to each wagon.

7. A structure according to any of the above claims, **characterized** in that the said rigid and flexible joints can be locked and detached independently of each other on the vertically successive decks (2, 3) of the same wagon combination, and that the joints are made and disconnected by means of a quick locking mechanism.

8. A structure according to any of the above claims, **characterized** in that the supporting bridge (5a...d) is formed as a beam which is dimensioned to be able as a protrusion to carry at least part of the weight of the vehicle 8, 9) or the like, and that the space of the ground clearance of the vehicles is utilized to give rigidity and strength to the beam.

9. A structure according to any of the above claims, **characterized** in that the outer dimensions of the supporting bridge (5a...d) are such, and at least one of the joints between the supporting bridge and a wagon is flexible in such a manner, that at least a substantial proportion of the forces between the wagons will not be trans mitted into the supporting bridge.

10. A structure according to any of Claims 3-9, **characterized** in that, when the supporting bridge is attached flexibly to both wagons, the joint will allow at least angular and longitudinal shifts between the supporting bridge and the wagon, all of the rectilinear shifts having been arranged, by means of resilient members, to return at least close to their initial point.

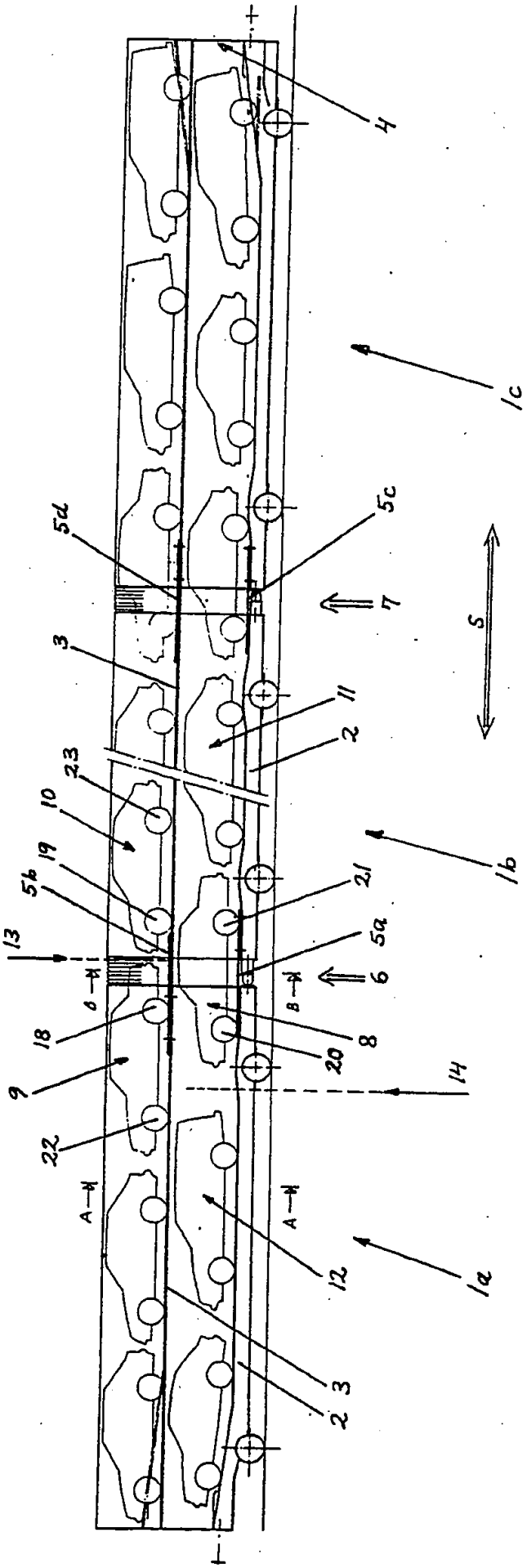
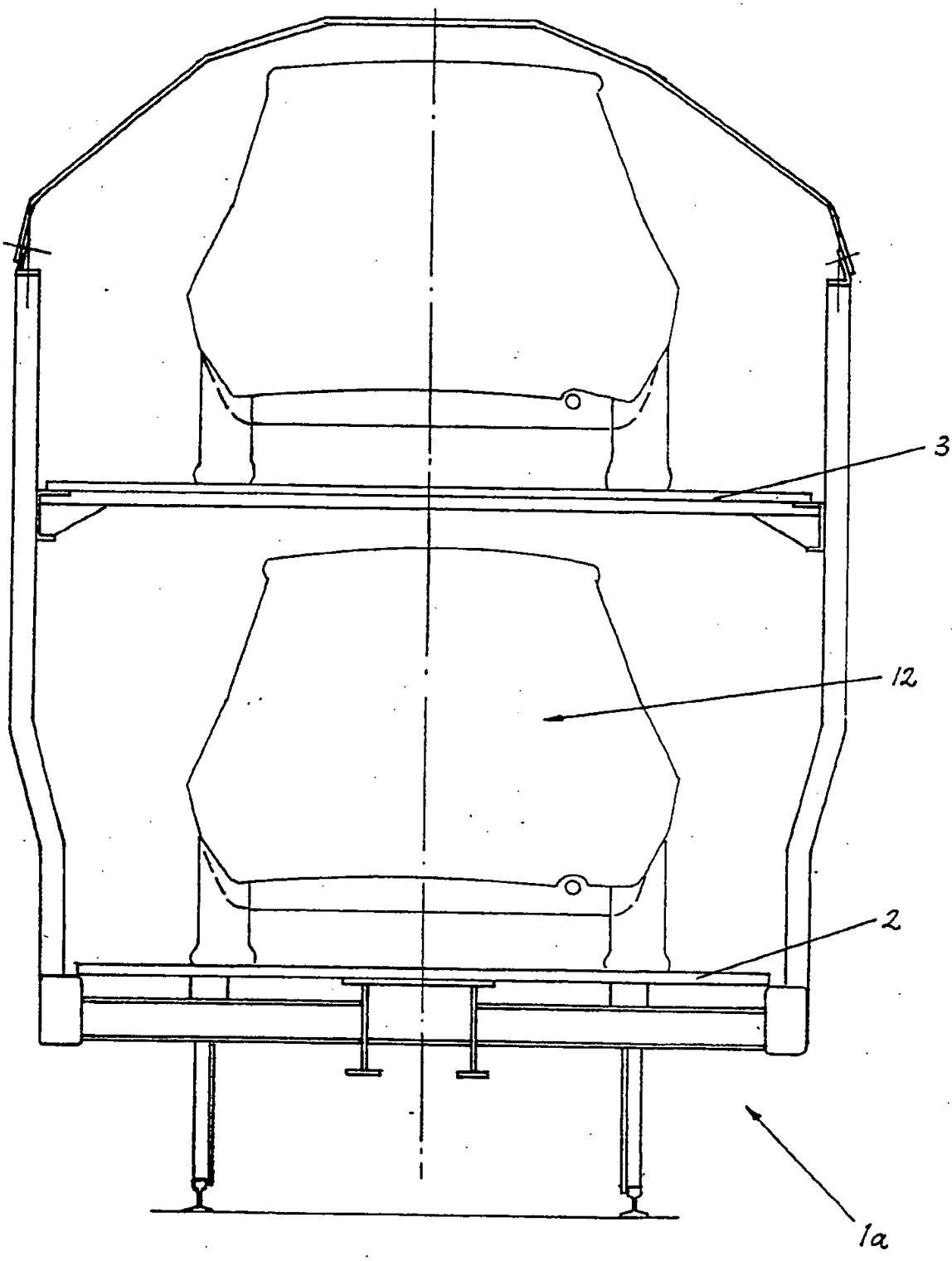
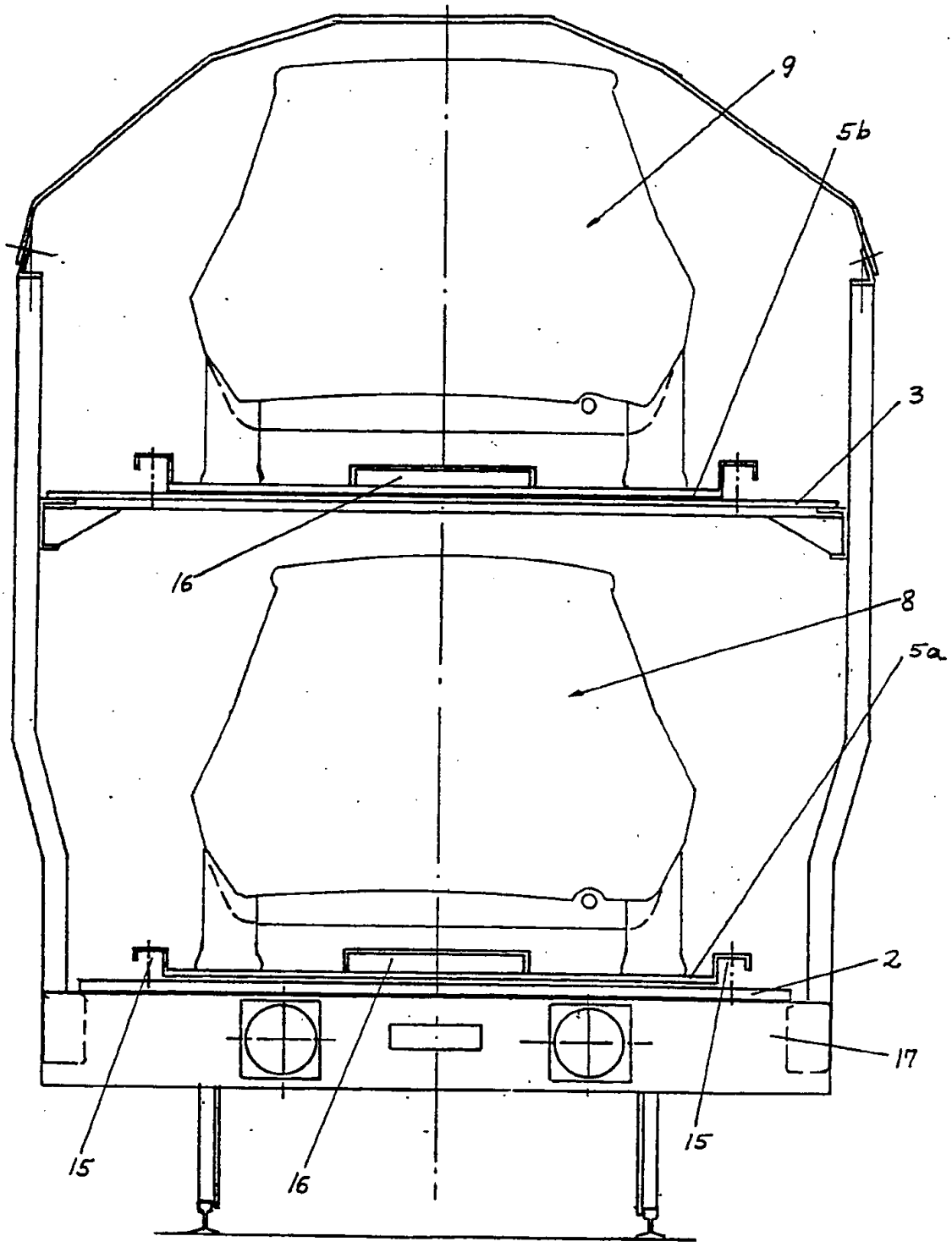


FIG 1



A — A

FIG 2



B — B

FIG 3